

## ABSTRACT

A method of forming a narrow diameter opening in an insulator layer, featuring a vertical shape profile, has been developed. Using a photoresist shape as an etch mask a first plasma procedure is used to form an initial opening, with a tapered profile shape, in the insulator layer exposing a portion of the top surface of an underlying stop layer. The first plasma procedure results in formation of a thin polymer layer located at the bottom of the initial opening. A second plasma procedure performed in situ, results in deposition of additional polymer layer, comprised of carbon and fluorine, at the bottom of the initial opening. This is followed by a third plasma procedure, performed in situ in an oxygen plasma, removing polymer and releasing fluorine based radicals which etch portions of insulator layer exposed at the bottom of the initial opening, resulting in a final opening featuring a vertical profile shape.